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ISSUESINBRIEF

UK LIFE INSURANCE

A SURVEY OF DYNAMIC POLICYHOLDER BEHAVIOUR IN EUROPE

A HUMAN CAPITAL APPROACH TO HOLISTIC FINANCIAL PLANNING

A LOOK INSIDE THE BOOMING SAUDI INSURANCE INDUSTRY

THE GROWING MARKET FOR LONGEVITY RISK TRANSFERS

INSIDE

I am writing this introduction

while attending the 29th International Congress of Actuaries in Cape Town, along with over 1,200 other actuaries from 94 nations. Many of the topics covered in this newsletter, including longevity risk management, ERM and capital modelling, feature prominently in the programme for the Congress, and the sharing of ideas which takes place at these events is valuable to attendees from developed and developing countries.

One area where international co-operation does not seem to be working well is in Phase 2 of IFRS for insurance contracts. At the time of writing, the exposure draft to be published in June is expected not only to preclude recognition of a profit at the point of sale, but to do so before allowance is made for acquisition costs. This will effectively take us back many decades to the days of unzillmerised net premium reserves. While it may theoretically improve comparability with other industries, it will render IFRS accounts largely useless as a means of understanding financial performance, and ensure that the need for supplementary embedded value information continues. The ideal of a single valuation for accounting and solvency measurement now seems further away than ever.

In contrast, the first quarter of 2010 has seen positive developments on the Solvency II front, with the recognition that a liquidity premium may be included in the risk-free rate in certain circumstances. The European Commission has yet to make a final decision, but there is clearly a strong will to find a practical solution without compromising the underlying principles. The level of activity on Solvency II implementation has stepped up a gear in recent months, and there are already some signs of the stresses this will place on companies as we approach 2012.

Nick Dumbreck
Equity Principal and
Consulting Actuary

The expansion of Milliman's life consulting presence in Europe has not always received the publicity it warrants, and we do our best to redress the balance in this issue with a summary of our current geographical coverage on page 18. Further announcements about our geographical expansion may be expected in due course.

If you would like to hear more, please contact me at *nick.dumbreck@milliman.com.*

MILLIMAN DYNAMIC POLICYHOLDER BEHAVIOUR SURVEY 2009

Dynamic policyholder behaviour (DPB) reflects the fact that a policyholder's propensity to exercise certain options available in a life insurance policy can be influenced by external factors. DPB modelling is becoming increasingly important, but it is an area where there is a great deal of uncertainty over the most appropriate approaches to take.

Towards the end of 2009 Milliman carried out a survey of the practices of European life insurance companies in modelling DPB. This covered traditional participating (profit-sharing) business with guaranteed surrender values, guaranteed maturity values and/or guaranteed annuity options.

SOME HIGHLIGHTS FROM THE SURVEY RESULTS

Taking part in the survey were 34 companies from six countries, including subsidiaries of multinationals and domestic insurers.

Types of DPB modelled

Of the companies surveyed, 26 model some type of DPB.

The chart in Figure 1 shows the number of companies with various types of policyholder options in their traditional products and the number modelling these as DPB.

FIGURE 1: MODELLING OF DPB BY TYPE OF GUARANTEE

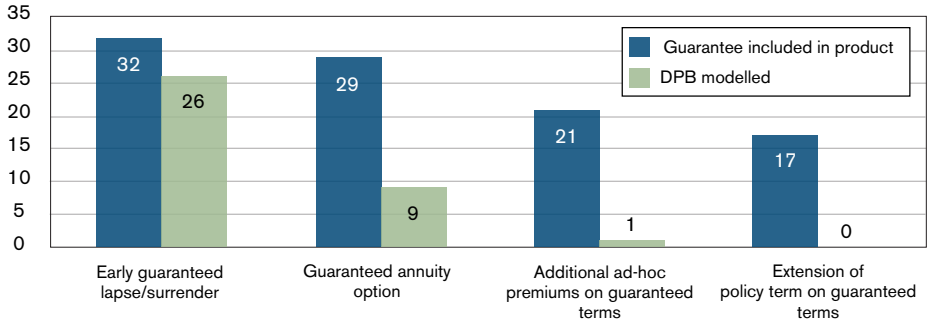
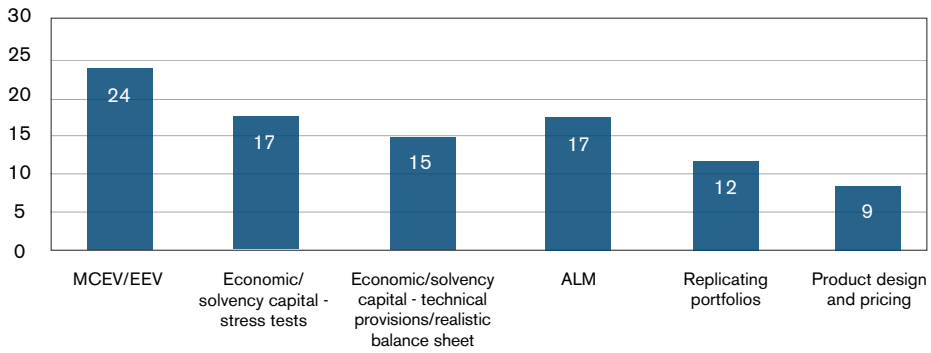


FIGURE 2: USES OF DPB MODELLING



The authors of the survey report believe that not modelling any DPB on such contracts is not a neutral assumption. Instead, it can represent an implicit assumption that policyholders do not behave rationally, which may be imprudent.

Uses of DPB modelling

The graph in Figure 2 shows the number of companies modelling DPB for different purposes.

The European Insurance CFO Forum Market Consistent Embedded Value (MCEV)

Principles[1] and most recent Solvency II proposals require consideration of DPB.

Allowance for DPB is perhaps most important when considering the extreme scenarios that are likely to drive economic capital requirements. Here DPB can be a significant risk. DPB is also a key risk when considering asset-liability management (ALM), replicating portfolios, and product pricing and design. Because the level of rationality of policyholders can be highly uncertain, sensitivities to different DPB models should be considered.

DPB models for early guaranteed lapse/surrender

This is the most significant area where DPB modelling is carried out by the survey respondents. The approach of all but one of the companies surveyed is to compare the credited rate paid to policyholders with some definition of an "external" rate to determine the key "driver" for DPB, as illustrated in Figure 3.

In addition to this key driver, various other factors are taken into account, including type of policyholder, type of policy, sales channel, and level of surrender penalties.

The graph in Figure 4 shows the two most common shapes for the function linking the key driver to lapse rates.

The report authors feel that particular care should be taken to ensure that the DPB model is appropriate in extreme scenarios.

DPB models for other options

Guaranteed annuity options are also modelled with an allowance for DPB by a significant number of the companies surveyed.

In many cases the value of guaranteed annuity options to policyholders can be very transparent, implying that modelling take-up rates of 0% (if the guarantee is out-of-the-money) and 100% (if the guarantee is in-the-money) could be appropriate, in the absence of particular constraints on the take-up of the guarantee. However, this is not generally the approach taken by the companies surveyed.

Derivation of DPB models

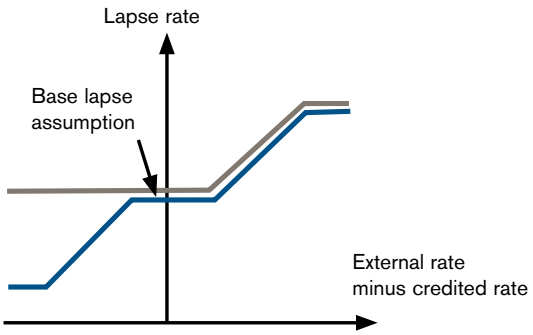
Less than half of the companies modelling DPB carried out a statistical analysis of their own past data to help parameterise their models and, for those that did, the extent to which such data was used was limited.

For various reasons, it can be difficult to use analyses of historical data for the setting of DPB assumptions. Although the authors argue that assumptions should not be set solely by looking at past observed experience, such analyses can be informative in indicating key risk factors that are driving DPB.

Management of DPB

Almost half of the companies modelling DPB that were surveyed had never monitored actual DPB experience against that predicted by their models. Only around half the companies have taken actions to mitigate the impact of DPB. These actions include product design and ALM/hedging.

FIGURE 4: LAPSE RATE AND KEY DRIVER



The authors feel that regular monitoring of the model against experience is an important exercise and should be part of the actuarial control cycle. Companies should also consider how the effect of DPB can be mitigated. In particular, it is important to assess the extent to which new products can be designed to be robust to different DPB assumptions.

CONCLUSIONS

This survey produced a great deal of information on company practices. DPB modelling is in its early stages, and we expect models to be developed and refined over the next few years, particularly in the light of Solvency II.

Milliman continues to carry out research in the area of dynamic policyholder behaviour. If you would like to receive a free summary report of the survey results, discuss this subject further, or participate in the planned 2010 survey, please contact Jeremy Kent at *jeremy.kent@milliman.com*

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FIGURE 3: DPB MODELLING APPROACH

CREDITED RATE: total policyholder return including minimum guaranteed return and profit sharing (e.g., in previous calendar year)

compared with

- **MARKET YIELD,** e.g., government bond yield/swap yield/spot yield/moving average of market yields over a specified number of years; fixed term (e.g., 10 years) or term depending on outstanding duration of contract
- **THEORETICAL COMPETITOR / BENCHMARK RETURN**
- **TARGET PROFIT-SHARING RATE**, e.g., previous year credited rate converging to the five-year market rate over a defined future period

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SOLVENCY II: THE STORY SO FAR

As the year-end reporting period draws to a close for most insurers, the focus in the industry on preparation for the implementation of Solvency II will intensify, and it is worth reflecting on developments in this area since the publication of the most recent batch of CEIOPS Consultation Papers (CPs) in November 2009.

Companies across the industry, large and small, are looking at their preparedness for Solvency II. As part of this process, companies have been undertaking gap analysis exercises to consider the current state of their processes, controls, documentation, systems and models, and where they want these to be in readiness for Solvency II. The initial stage of such a gap analysis is for the company Board and senior management to consider carefully what they want to achieve under Solvency II–is it a compliance exercise or will they embrace the Solvency II objectives and motives of holistic risk management and integrated economic capital management more fully? Once the 'end point' is set, a thorough comparison to the current situation can be made and an implementation plan drawn up, showing how to get to the desired position. A full gap analysis should cover all areas of the business, from strategic to operational levels, and from the quantitative requirements of Pillar I to the governance and risk management systems of Pillar II and the reporting requirements of Pillar III.

LEVEL 2 ADVICE

The November CPs were the third wave of proposals from CEIOPS, and, as with the earlier waves of CPs, they received voluminous feedback from European insurers and industry bodies. In January, following this feedback, CEIOPS published its final advice to the European Commission on most of the areas covered. Some of the changes in the final advice include:

- A reduction in the equity shock for "other" equities to 55%, and a reduction in the volatility shock from 60% to 50%.
- A reduction in the interest rate stresses so that most are now weaker than those proposed in QIS4.
- Introduction of correlations for interest rate risk that vary depending on whether the "up" shock or the "down" shock is the more onerous.
- A reduction in some of the correlations in the life underwriting risk module.
- A change to the rules around projecting future Solvency Capital Requirements (SCRs) in order to calculate the risk margin. A full calculation of future SCRs is no longer required unless this is needed to capture the risk profile of the undertaking.

LIQUIDITY PREMIUM

Preliminary indications are that a CEIOPS-appointed industry task force is still undecided over its recommendations to the EC as to whether a liquidity premium should be allowable when discounting illiquid liabilities, such as annuity benefit payments. An allowance would allow insurers to take partial credit for the higher yields available on corporate debt used to back annuity business.

In its final Level 2 advice on the matter, CEIOPS mooted the idea, but proposed strict restrictions on the business to which it would apply. It stated that a liquidity premium should be allowable only for retirement annuities that are in payment at the point Solvency II comes into force, and that are backed in the most part by corporate bonds which adequately match the liability cash flows. In addition, CEIOPS proposes a change to the SCR calculation whenever a liquidity premium is allowed in the calculation of the technical provisions. This change would, amongst other things, require companies to stress the size of the liquidity premium in the SCR calculation, and would prohibit diversification benefits between liquid and illiquid liabilities. Such a change would reduce any capital benefit obtained from holding corporate debt to back annuity liabilities.

INTERNAL MODELS: PRE-APPLICATION PROCESS

In February, the FSA released an update on key developments around the "pre-application" phase of their internal models application process (IMAP), which will commence in April. The update provides early conclusions from the pilot programme, which has been conducted with four firms of varying size and complexity in recent months. The general indication is that pre-application will be a testing process for firms, and it is likely that many firms' assessments of their levels of preparedness will prove to have been over-optimistic. The update also highlights issues faced by insurance groups, and indicates that these will be more complicated than predicted for IMAP as well as other aspects of Solvency II. According to the IMAP update, the pilot exercise "has demonstrated the importance of ensuring that model scope and design includes all relevant firms". The FSA recommends early engagement on this issue.

OTHER ISSUES

By the time this article goes to print, it is likely that the draft QIS5 technical specifications will have been made public, and these are sure to undergo careful scrutiny.

For more information on how Milliman can help your firm prepare for Solvency II, please contact Oliver Gillespie at *oliver.gillespie@milliman.com*, Robert Bugg at *robert.bugg@milliman.com*, or your usual Milliman consultant.

REAL-TIME CAPITAL MANAGEMENT AND THE SOLVENCY II 'USE TEST'

The Solvency II Directive gives insurers the opportunity to develop and use internal models for calculating and reporting their Solvency Capital Requirement (SCR) to the supervisor. It is intended that these internal models used for quantifying potential losses replace parts, or even all, of the standard SCR model developed by CEIOPS.

There are some clear strategic advantages to using an internal model approach. An internal model is likely to be able to give a better insight into risks faced by a firm, with explicit capture and coverage of specialised and complex risks particular to the organisation. There are also obvious synergies from having consistency in methodology and framework. One approach would be to make use of stochastic scenarios instead of deterministic factor-based stresses. This would enable complex modelling of management actions reflecting the organisation's risk management framework and an integrated approach to the quantification of correlation risks. However, such an approach would not lend itself to frequent calculation and ongoing assessment for everyday use within an organisation.

One of the key requirements to be met by organisations intending to use an internal model is the 'Use Test' outlined in CEIOPS' advice (former Consultation Paper 56). There are three main areas in which an internal model may be used as an important component of internal risk management processes: (1) strategy and planning processes, (2) risk exposure management, and (3) reporting and attribution. Furthermore, a fundamental principle is that an undertaking's use of the internal model be sufficiently material to create pressure to improve the quality of the internal model.

Measures that would be consistent with this view include:

- Use of the model in the day-to-day risk management practices of the organisation;
- Frequent capital monitoring that is consistent with these risk management practices.
- Regular performance attribution analyses where the model explains a sufficiently large component of the experienced financial result over a given period, which then informs management decisions

These measures are naturally within the scope of the modelling framework used for hedging of portfolios with financial guarantees. Hedging models are used actively and explicitly for day-to-day management of exposure to the key financial risks faced by these guarantees. In order for these hedges to perform well, there is a demand for accurate and reliable models. Furthermore, a crucial part of the hedge cycle is the performance attribution reporting, which demonstrates the performance of the hedge over time and highlights any significant sources of residual risk that need addressing.

An alternative framework that could be used for day-to-day risk management is that of replicating portfolios. These techniques involve using a portfolio of assets to match the risk exposures of a portfolio of guarantees as closely as possible; the benefit is that valuation of these assets on a frequent basis is more practical. However, such replication of liabilities is becoming increasingly difficult because of the increasing complexity of guarantee

(CONTINUED ON PAGE 9)

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A HOLISTIC FRAMEWORK FOR LIFE CYCLE FINANCIAL PLANNING

Financial planning has traditionally been an area that has received relatively little focus by the actuarial community. However, being one of the most important roles that the financial services industry provides to society, its efficient operation is critical for customers to be able to achieve their financial goals throughout their lives.

The current framework used to frame product propositions is primarily focused on illustrating wealth accumulation products through the use of deterministic projections based upon constant return assumptions. One of the limitations of such a framework is that it is not able to demonstrate the impact and value of guarantees or path-dependent payoffs such as ratchet features. This has the potential to introduce biases into the advice process and thus affect relative product propositions.

Post-retirement product comparisons typically focus only on starting income levels and generic features. They do not provide distributors or customers with the information needed for them to make fully informed decisions. With the increasing use of retirement-related guarantee products, and an increasing appreciation of risk by the consumer, there is an urgent need now for a new approach to financial planning and the framing of product value propositions.

The five central elements of a holistic financial planning framework are:

1. Management of total wealth including human capital and all sources of financial capital
2. Goals framed in terms of consumption and income
3. Risks explicitly identified, assessed, and managed
4. Illustration analysis that is stochastic, objective, and consistent
5. Determinations of "value" that consider behavioural biases

Human capital plays a central role in a holistic financial planning framework. Essentially, human capital represents the present value of future disposable income. It is a real asset as it is able to be monetised through borrowing, its value influences the demand for life insurance (i.e., protection products), and its future yield determines future income, savings, and consumption. Just like financial capital,

it also exhibits risks as it can be highly correlated to the broad economy, equity market performance, or the performance of specific industries or stocks. Optimising the risk return trade-off of financial wealth thus involves consideration of the human capital versus financial capital risks and the correlation between the two.

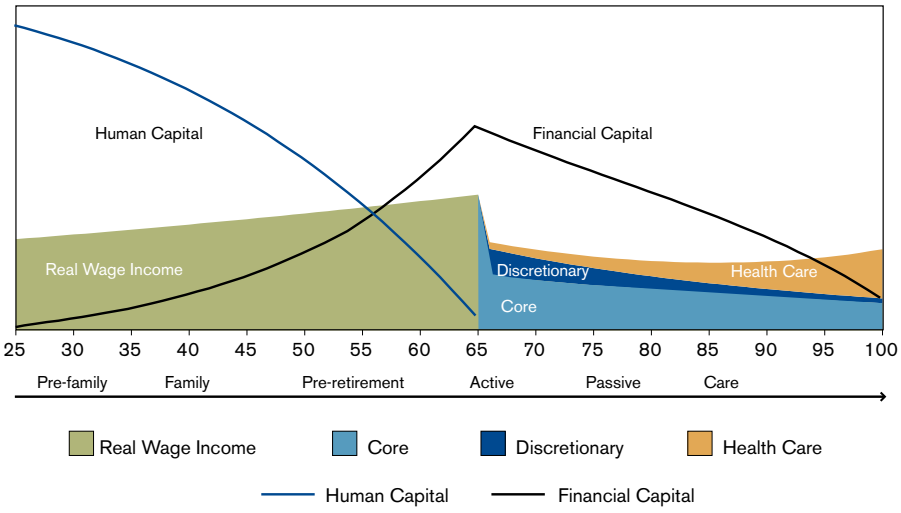
The diagram in Figure 1 illustrates the transition of human capital into financial capital and back into income over a typical person's life. Wealth is simply a mechanism for the deferral of consumption. As wealth is a means to an end, financial goals should thus be framed in terms of providing the income required to meet consumption needs and wants.

Once goals have been properly framed, the next step is to identify and assess the risks related to meeting these goals. For very long-term goals such as retirement provision, these risks may change over time; for example, risks related to adverse mortality, longevity, and interest rate movements. When all risks have been assessed, it is then necessary to identify the minimum risk investment/product strategy. This forms an important benchmark from which alternative strategies can be assessed in terms of both their outcome profiles and relative risks.

To assess which strategy represents the best "value" for a particular consumer, objective and consistent illustrations need to be undertaken using stochastic analysis. These are needed to demonstrate the impact of path-dependencies in products such as guarantees. Crucially, this enables a fair quantitative assessment of alternative products and investment strategies that may otherwise be very difficult or even impossible. Structuring the presentation of this information, whether in tabular, graphical, or explanatory format, is a critical part of the communication process.

To enable customers to determine what constitutes "value" for themselves, it is necessary to incorporate their risk preferences, as well as their behaviour biases.

FIGURE 1: TRANSITION OF HUMAN CAPITAL



Over the last few years, the field of behavioural finance has made significant inroads into understanding how the average person makes financial decisions. Behavioural biases such as hyperbolic discounting, mental accounting, and myopia have been shown to have a material effect upon the decision-making process. Consequently, it is critical to address these biases up front in both the analytical framework as well as in the presentation and communication of information to consumers.

The above ideas are outlined in much greater detail in our groundbreaking research paper, *A Holistic Framework for Life Cycle Financial Planning*. The paper is relevant to all those working in the fields of product development, financial advice, and distribution. To access the research paper, please visit our Web site at *http://uk.milliman.com/perspective/research/pdfs/holistic-framework-life-cycle.pdf*.

HUMAN CAPITAL PLAYS A CENTRAL ROLE IN A HOLISTIC FINANCIAL PLANNING FRAMEWORK.

Recent advances in stochastic analytics and its associated tools and systems now enable such financial planning frameworks to be implemented efficiently. We at Milliman have been helping our clients to do this, enabling them to frame the value propositions of all their investment, insurance, and pension products on a consistent basis. If you would like to find out more about how Milliman can help you implement this type of holistic advice framework, please contact Joshua Corrigan at *joshua.corrigan@milliman.com*.

TAS: ARE YOU READY?

In response to the Morris review of the UK actuarial profession, published in March 2005, HM Treasury asked the Financial Reporting Council (FRC) to:

1. Take responsibility for oversight of the actuarial profession
2. Set technical actuarial standards

The FRC established the Board for Actuarial Standards (BAS) with the remit of setting technical actuarial standards. BAS initially adopted 37 of the Guidance Notes (GNs) originally issued by the actuarial profession.

BAS is now developing new standards to replace the GNs. The new standards developed by BAS are called technical actuarial standards (TAS).

The final versions of the first two TAS documents were published in November 2009:

- TAS R on reporting actuarial information
- TAS D on data

TAS R has an effective date of 1 April 2010; TAS D has an effective date of 1 July 2010. However, BAS encourages early adoption where this is practical.

TAS R contains some important definitions. A "component report" is defined as information that is in permanent form, such as a formal report, presentation, or an e-mail, and that contains information material to the user's decision. An "aggregate report" is defined as the set of component reports used in the decision, and it may consist of one or more aggregate reports. It is important to note that component reports include draft reports.

Component reports do necessarily need to comply with TAS R. However, the aggregate report based on the component reports must comply with TAS R. The high-level topics in TAS R are:

- Application of the TAS
- Relevance
- Transparency
- Completeness
- Comprehensibility

There are a number of further requirements under each of these headings. For example, where an aggregate report quantifies a cash flow, it must disclose the nature and the timing of the cash flow. There are a number of ways of disclosing the timing, including:

- Showing the discounted mean term
- Showing the underlying cash flows
- A qualitative description of the anticipated timings

Another requirement in TAS R is around projections. If an aggregate report contains regularly repeated calculations, TAS R requires that the report include future projected results. This requirement may be challenging in some cases. For example, if an ICA calculation does not currently project results, then there is a need to develop the model to incorporate this.

TAS D applies to the data used in preparing reports. (A report in this context is either an aggregate report or a component report.) The high level areas in TAS D are:

- Application of the TAS
- The interaction with TAS R
- Documentation
- Data requirements
- Data definitions
- Data validation
- Incomplete or inaccurate data

Within the data validation area, the need to check data does not create an audit requirement, and the extent of the checks required depends on a number of factors, such as the data's source and the extent of checks already carried out by third parties.

BAS is currently working on a range of other projects that will generate new TASs, shown in the table in Figure 1.

If either TAS R or TAS D applies to you, it is worth taking time to familiarise yourself with their contents. For more information on how Milliman can help you prepare for the introduction of TAS, contact Matthew Cocke at *matthew.cocke@milliman.com*, Philip Simpson at *philip.simpson@milliman.com*, or your usual Milliman consultant.

FIGURE 1: FUTURE TAS DOCUMENTS

Project	Consultation Paper Date	Exposure Draft Date	Planned TAS Date
Actuarial information for users of accounts and other financial documents	October 2009	Planned Q2 2010	Q4 2010
Insurance	September 2009	Planned Q1 2010	Q4 2010
Modelling	November 2008	May 2009 and December 2009	Q2 2010
Pensions	June 2009	February 2010	Q3 2010
Prepaid funeral plans	n/a	Planned Q3 2010	Q1 2011
Transformation	December 2009	Planned Q2 2010	Q4 2010

REAL-TIME CAPITAL MANAGEMENT AND THE SOLVENCY II 'USE TEST'

(CONTINUED FROM PAGE 5)

benefits, with traditional replicating portfolio techniques providing only approximate solutions for complex guarantees.

These techniques may rely upon assets for which there is no credible market liquidity and, whilst they may allow for some of the behaviour of risk exposures in extreme scenarios, they give little insight into potential practical hedging solutions. Alternatively, if the techniques were to be limited to widely available market instruments, then a sophisticated hedge program would already incorporate many of these assets as a hedge to the guarantee portfolio. For more insightful risk management, the internal model should focus on the residual differences between such assets and the portfolio of complex guarantees that may arise because of sophisticated product features (such as ratchets, resets, and options) and fundamental differences in term. These limitations to the continued relevance of an internal model to the day-to-day risk exposure management of guarantees do not fit well with the requirements of the 'Use Test'.

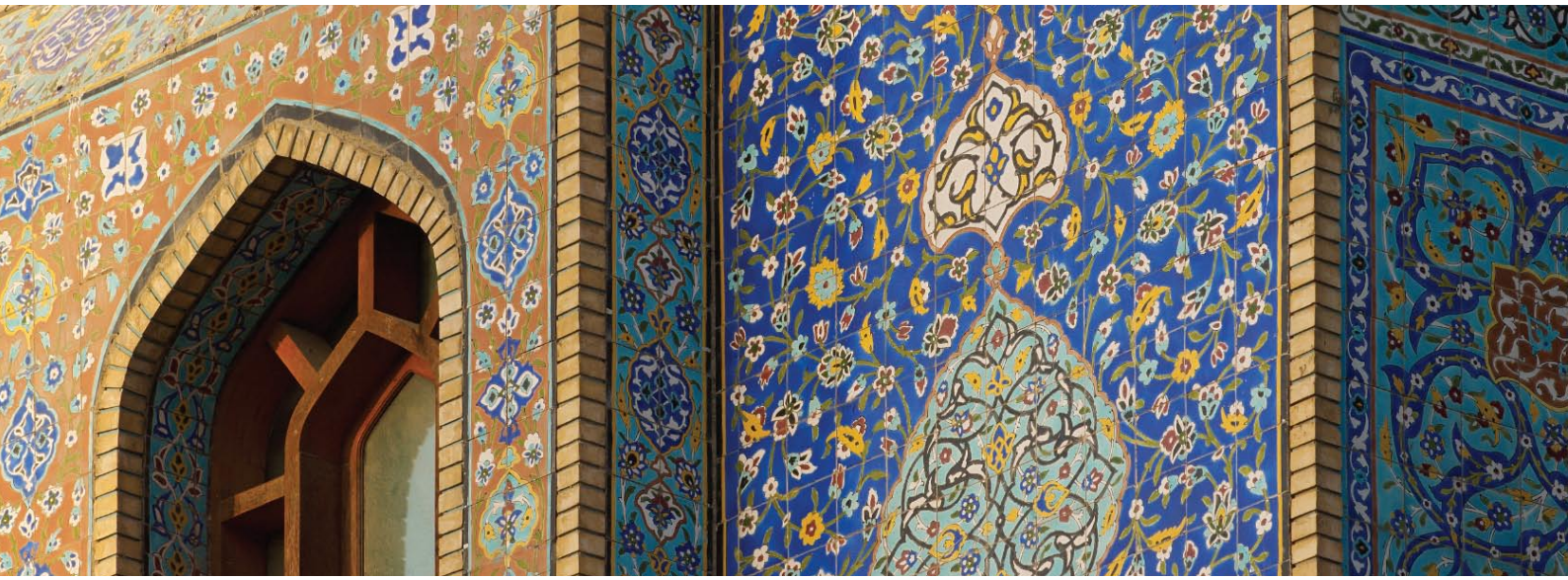
True replication of exotic guarantees involves explicitly measuring the liability Greeks, as used within the dynamic hedging framework. The dynamic hedging framework uses frequent and accurate assessments of the liability risk exposures to calibrate a portfolio of hedge assets, and also to enable day-to-day monitoring of this calibration. The ability to rebalance this portfolio would enable true replication, accounting for the complex behaviour of guarantee risk exposures as they change over time, and in particular allowing for their long-term nature.

There are also clear business synergies from optimising a framework already used for ongoing risk management, to calculate additional exposures for solvency purposes, compared to an independent tool that relies heavily on frequent validation against explicit valuations. Daily risk exposures used for hedging could easily be adapted to derive exposures for daily solvency monitoring. This would be based upon models that are extensively tested as fit-for-use, and validated through regular performance attribution, as well as directly used for actual risk management decisions.

MG-Hedge® has been used by the global insurance industry for over a decade to fulfil all of these functions. It is the ideal platform to provide real-time capital assessment as well as risk management and performance measurement. Hedge programs using MG-Hedge typically have a daily assessment of the portfolio risk exposures calculated on a per-policy seriatim basis and on a per-hedge asset basis. These risk exposures are calculated to allow for the ability to trade even in extreme market scenarios during a given day. These calculations also incorporate the VaR impact under given scenarios, to provide such real-time capital assessment under a consistent modelling framework, and are being carried every day by Milliman and its clients with MG-Hedge.

If you would like to find out more about how Milliman can help you implement a daily capital monitoring and risk management framework and/or meet the requirements of the Solvency II 'Use Test', please contact Gary Finkelstein at *gary.finkelstein@milliman.com* or Neil Dissanayake at *neil.dissanayake@milliman.com*.

SAUDI INSURANCE: A MUSHROOMING MARKET



Five years ago, there was only one insurance company officially operating in the Kingdom of Saudi Arabia. By the third quarter of 2009, the Saudi insurance regulator Saudi Arabian Monetary Agency (SAMA) listed no fewer than 21 fully licensed insurance and reinsurance companies, with the establishment of a further six companies approved by the council of ministers; not to mention the ever increasing numbers of brokers, insurance agencies, actuaries, assessors, and advisors. Further, despite the global economic downturn, the Saudi insurance industry has been posting annual growth of 25%-30%, with gross written premiums in 2008 reaching SR 10.9 billion ($2.9 billion). With the market predicted to become one of the fastest growing insurance industries across the world, and expected to reach SR 15 billion ($4 billion) by 2012, this article takes a look at the 'magic' behind this mushrooming phenomenon in the Middle East.

DRIVING CHANGE

Insurance used to be a relatively unknown concept in the Kingdom of Saudi Arabia, a very conservative Muslim society. It was either unheard of or disapproved of as it was thought to be contradictory to Islamic Sharia law, which strongly forbids interest, gambling, and products that resemble such features. However, within a comparatively short space of time, a number of legislative drivers have mandated change in the industry, driving phenomenal growth.

The first was the passing of the Cooperative Insurance Control law in 2003. This legislated that all Saudi insurance products must be Sharia-compliant, thereby eliminating, in theory at least, any ethical barriers for the largely conservative Muslim consumer base. As such, the only insurance allowed in the Kingdom is Takaful. Otherwise known as Islamic insurance, Takaful is a form of collective insurance that has to be approved by Islamic scholars. It differs from conventional insurance in that it requires that a portion of the pool of premiums be redistributed periodically to customers, assuming there are funds available after claims have been paid. Insurance companies make their margins via management fees.

The second driver was legislation introducing compulsory insurance in the motor and medical industries, making these the largest segments of the insurance market in the Kingdom (51% and 44% respectively). These measures brought the industry starkly to the attention of the burgeoning Saudi population, who may not otherwise have been interested.

LIFE INSURANCE: UNTAPPED POTENTIAL

Life insurance can be considered to still be in its infancy in the Kingdom, having the lowest penetration in the region (0.02% GDP). In addition, there are currently only a handful of life insurance providers in the Kingdom. At the end of 2008, life insurance premiums (SR 594 million/$158 million) accounted for only approximately 5.4% of the total insurance industry premiums. That said, the volume represented a staggering 82% growth over the previous year—the fastest-growing sector in the market—fuelled partly by the usual dynamics of increased awareness among the affluent population and the availability of products to meet their risk management needs.

Insurance companies see much room for growth in this area as the concept of insurance (Takaful) and the products available become more familiar to the local population. They are aggressively marketing life products, largely via their links to major banks, using the banks' extensive distribution network and the opportunities arising from the provision of banking products and advice to attract

customers to protection or savings insurance. However, SAMA requires that banking and insurance must be marketed separately and cannot be bundled together, increasing the challenge for bancassurance products.

Further, the booming economy and the need to attract and retain high-quality staff via employee benefits have fostered the growth of the group life industry.

There is also a large portfolio of group credit life schemes that are either currently uninsured or self-insured, creating opportunities to provide coverage for millions of lives.

THE MARKET

Today, there are 27 insurance companies listed on the Saudi stock exchange (Tadawul). However, the Saudi Arabian insurance sector continues to be dominated by the three biggest players—Tawuniya, Medgulf, and Bupa Arabia. The market is dominated by health products that are double the value of the next most popular insurance line, motor. They account for around 40% and 20% of the insurance market, respectively.

THE MARKET IS DOMINATED BY HEALTH PRODUCTS THAT ARE DOUBLE THE VALUE OF THE NEXT MOST POPULAR INSURANCE LINE, MOTOR.

Unsurprisingly, the rapid growth has also led to a shortage of professionals, with specialists hard to come by, especially amongst the local population. The industry will need highly qualified and trained insurance professionals to give direction to this fast-paced growth.

OUTLOOK

Increased awareness and education amongst the Saudi public with respect to insurance, coupled with further legislation, are likely to strengthen the fast pace of growth in the industry. It is telling, however, despite the massive amounts of wealth in the country, that insurance penetration at the end of 2008 represented just 0.62% of GDP, and that the average Saudi pays less than $100 in insurance premiums per year. As such, the potential for further market expansion is huge and the mushrooming of the Kingdom's insurance market continues.

For more information, please contact Safder Jaffer at *safder.jaffer@milliman.com*, or your usual Milliman consultant.

Line of Business	2005		2006		2007		2008		% change from 2007 to 2008
	SR (m)	%	SR (m)	%	SR (m)	%	SR (m)	%	
General Insurance	3,589.9	69.7%	4,497.1	64.8%	5,190.7	60.5%	5,520.1	50.6%	6.3%
Health Insurance	1,370.3	26.6%	2,222.2	32.0%	3,065.0	35.7%	4,805.2	44.0%	56.8%
Life Insurance	193.2	3.7%	217.9	3.1%	327.0	3.8%	593.7	5.4%	81.5%
Total	5,153.4	100.0%	6,937.3	100.0%	8,582.7	100.0%	10,918.9	100.0%	27.2%

Source: SAMA 2008 Insurance report

AVOIDING OVERSIMPLIFICATION IN RISK ANALYSIS

In real life it is generally obvious that the things happening around us have quite complex causes. In order to make sense of these events, however, we often try to label them with a "primary" cause so that we can try to identify events that are similar and begin to learn about their overall characteristics (e.g. frequency and severity). This typical reductionist approach studies the problem from a simpler perspective and then extrapolates back to make sense of the original problem.

The issue with this approach is that companies are not simple and their risks arise from the complex interactions of many factors. The science of complex systems tells us that it is highly dangerous to study such phenomena in terms of a single factor. You lose vital information about how the observed results may have been caused, and studying the behaviour of the individual components of the risk profile cannot tell you about the observed final risk outcomes.

Solvency II requires firms to analyse their particular risk profile and to explain how the risk profile is changing over time. To do so using a single-characteristic classification system is flawed. Indeed most firms find that it is a time-consuming exercise to aggregate the information held within risk registers, and one which yields little useful information. One reason for this is that the events no longer really make sense when summarised by a single characteristic, and so adding them up gives a very jumbled view of what is really going on.

In the following example, we show how it is possible to classify risks fully according to their multiple underlying characteristics. This enables an understanding of:

- How the risk profile is evolving
- Which risks are similar to each other
- How the risk profile might change in the future

Many risk management systems already use a range of "characteristics" to classify risks.

FIGURE 1: RISK CHARACTERISTICS

Strategic	1	Strategy		
Market	2	Asset allocation	3	Concentration
	4	Other		
Credit	5	Investments	6	Reinsurance
	7	Other		
Insurance	8	Insurance		
Operational	9	Unacceptable business practices	24	Mishandling of investment transactions
	10	Internal control violations	25	Liquidity needs unmet
	11	Project failures	26	Mis-pricing/design of products
	12	Communication failure	27	Mishandling of underwriting
	13	Brand abuse	28	Inadequate reinsurance
	14	Violation of reporting regulations	29	Inadequate claim management
	15	Solvency	30	IT systems failure
	16	Violation of disclosure requirements	31	Unauthorized access to data
	17	Customer due diligence	32	Inadequate functionality
	18	Product compliance	33	Inappropriate skills
	19	Mis-selling	34	Staff act outside authority/competence
	20	Mishandling data	35	Business interruption
	21	Incomplete documentation	36	Adverse legal/regulatory change
	22	Systemic reporting error	37	Other
	23	Mishandling of complaints		

People find it hard to choose which label to put on each risk because, intuitively, they know the cause is a combination of factors. We consider a list of 22 risks that we classify according to the characteristics shown in Figure 1.

First we look at how the risks are treated under a single-characteristic approach; the second column in the table in Figure 2 shows how the risks would be labelled on that basis. The labels heavily influence how management perceive and think about the risk and its ownership, so classification is not a trivial exercise.

We now approach the classification in a different way, and for each risk we identify which of the 37 characteristics apply without limiting the number of characteristics that can apply. Some risks may now have only one characteristic whereas others will have many. This is shown in the third column of Figure 2.

This essentially breaks the risks down, describing them in terms of their "DNA"; based on this, Milliman's Risk DNA Analysis™ offers a simple way to glean a significant amount of information about the risks emerging in your business without losing valuable information about how each risk is formed.

Many of the risks share some characteristics, but can we work out which are really similar? To answer this, we use an analysis technique from biology (see sidebar), which looks at how things can be most simply classified with reference to their characteristics.

If we carry out such an analysis on our example list of risks, we obtain the graphical representation of the relationships between our risks shown in Figure 3. Where two risks are on the same branch of the tree, they are more closely related than to risks on branches further away. So, for example, we can see that the "Product" and "Tax rules" risks are quite

Cladistics

Early attempts to classify biological phenomena required an initial labelling process with reference to a hierarchy of criteria–not dissimilar to the way in which a typical risk classification system works today. However, biologists found this to be unsatisfactory because organisms would often share similar high-level classification traits but ultimately bear little resemblance to each other. Although the theories underlying cladistics have been in place since the 1960s, they have only really become popular in the past few decades because of the availability of increased computing power. Cladistic analysis differs fundamentally from previous approaches in that it does not attempt to match items to a predetermined list of criteria–rather it simply looks at the characteristics of the phenomena being studied and identifies a way to group them in the simplest way.

closely related, whereas the "Product" risk is not closely related to the "HR policies" risk.

The tree is studied from left to right. As we move to the right, the tree branches to indicate points where the characteristics of risks are separating in evolutionary terms. The chart in Figure 3 shows how we can group the risks according to the characteristic of the main branch they belong to. In this case, it seems that there are four dominant features of this company's risk profile. Note that, unlike the single-characteristic classification approach, we are not saying that all of these risks share that characteristic as a main feature. We are simply showing that, overall, the risks in this branch have more in common than they do with risks on other branches.

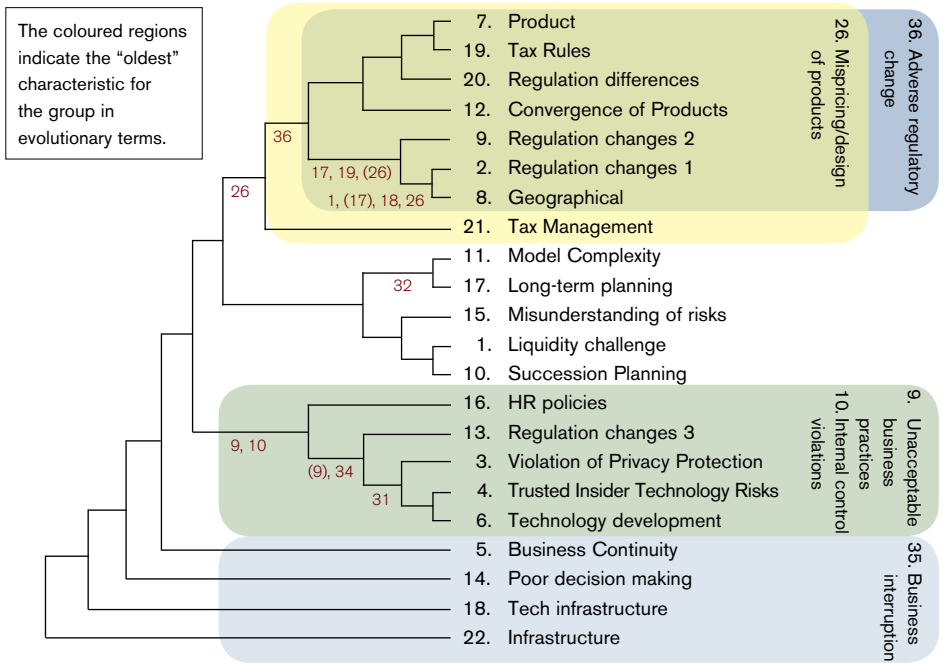
The bold red figures show the characteristics that dominate that branch (i.e., at least half of the nodes on both sides of the branch point share those characteristics). A figure in brackets represents a characteristic that is removed at that branch point.

(CONTINUED ON PAGE 17)

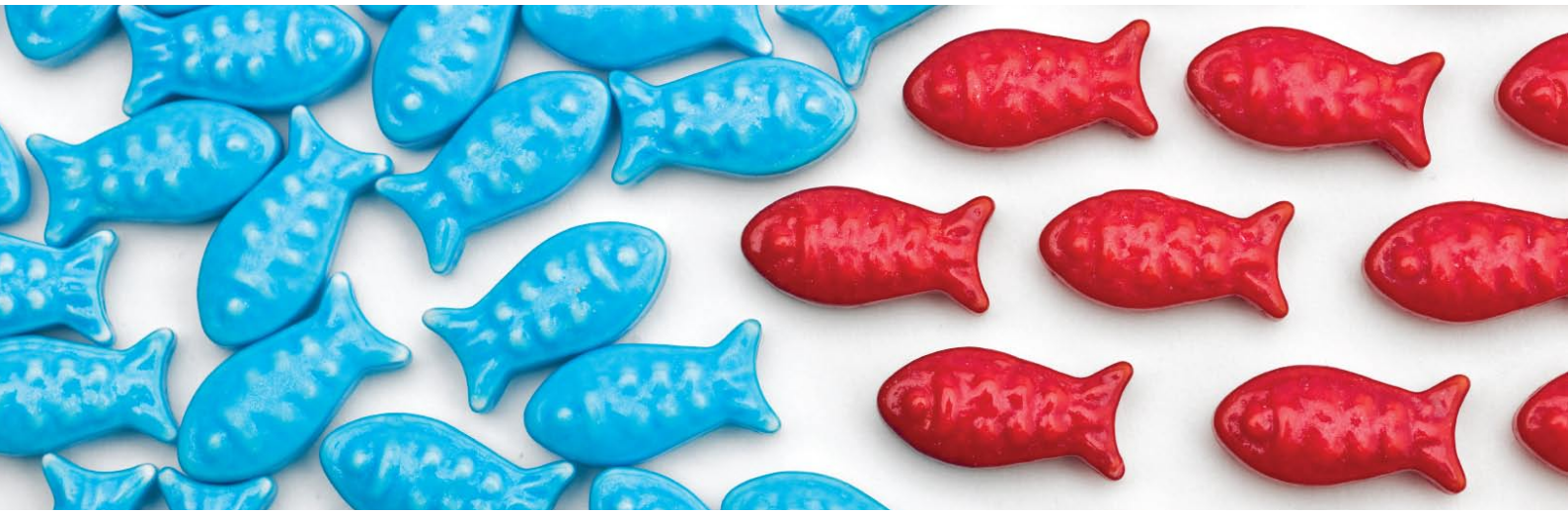
FIGURE 2: RISKS CLASSIFIED BY MAIN CHARACTERISTIC

Risk Scenario	Characteristic	All Applicable Characteristics
1. Liquidity challenge	Liquidity needs unmet	25
2. Regulation changes 1	Adverse legal/regulatory change	1, 15, 16, 17, 18, 19, 26, 33, 36
3. Violation of privacy protection	Unauthorized access to data	9, 10, 12, 14, 17, 20, 21, 31, 34
4. Trusted insider technology risks	IT systems failure	10, 31, 34
5. Business continuity	Business interruption	12, 30, 35
6. Technology development	IT systems failure	10, 31, 34, 35
7. Product	Mis-pricing/design of products	26, 36
8. Geographical	Strategy	1, 2, 8, 18, 19, 26, 36
9. Regulation changes 2	Adverse legal/regulatory change	17, 19, 36
10. Succession planning	Inappropriate skills	33
11. Model complexity	Systemic reporting error	21, 22, 32
12. Convergence of products	Mis-pricing/design of products	1, 26, 36
13. Regulation changes 3	Adverse legal/regulatory change	9, 10, 34, 36
14. Poor decision making	Staff act outside authority/competence	1, 35, 37
15. Misunderstanding of risks	Internal control violations	2, 3, 12
16. HR policies	Inappropriate skills	9, 10, 12, 37
17. Long-term planning	Strategy	1, 32, 33, 36
18. Tech infrastructure	Inadequate functionality	30, 35, 37
19. Tax rules	Adverse legal/regulatory change	16, 26, 36
20. Regulation differences	Adverse legal/regulatory change	18, 26, 36
21. Tax management	Internal control violations	26
22. Infrastructure	Business interruption	30, 35, 37

FIGURE 3: RISKS HIGHLIGHTED BY SIMILAR EVOLUTION



A BOOST FOR LONGEVITY RISK TRANSFERS



As investors attempt to diversify their portfolios away from traditional risky assets, the market in longevity risk has been given a boost by the recent launch of the Life and Longevity Markets Association (LLMA). This not-for-profit venture was launched on 1 February 2010 and aims to promote a transparent and liquid traded market in longevity and mortality-related risk.

The capacity to absorb longevity risk in the insurance and reinsurance industry is currently small compared to the huge volume of global pension liabilities, so the LLMA will seek to create the products and infrastructure necessary to facilitate easier and more cost-effective capital market longevity risk transfers through product and process standardisation. This will build upon the momentum that has developed during the past year in the volume of pure longevity transactions, with several innovative deals completed, as listed in the table in Figure 1.

FIGURE 1: RECENT LONGEVITY RISK TRANSACTIONS

Date	Participants	Type	Structure	Amount
	Pension Scheme			
Feb-10	BMW with Abbey Life /Paternoster	Swap	Indemnity	~£3bn
Oct-09	Babcock International with Credit Suisse / PacLife Re	50-year swap	Indemnity?	~£250m
Jun-09	Babcock International with Credit Suisse	50-year swap	Indemnity?	~ £300m
	Insurance Company			
Jul-09	Rothesay Life / PacLife Re	Swap	Indemnity?	~£500m
Mar-09	Aviva with RBS / PartnerRe	10-year swap	Indemnity	~ £475m
Sep-08	Canada Life with J.P. Morgan	40-year swap	Indemnity	~ £500m
Feb-08	Lucida with J.P. Morgan	10-year swap	Parametric	~ £100m

Source: press releases

The resources of the LLMA will be directed towards three key work streams. The first is the technical aspect of such transfers, for example, valuation modelling, product design, index production, and risk management. The second is the documentation of the association's research, and the third is accessibility of its output. The focus of the third work stream is to make LLMA output accessible to appropriate stakeholders.

According to the LLMA, its output is likely to include:

- A glossary of standardised terms to describe longevity-related risks
- Standardised longevity product definitions
- Longevity indices and index methodologies
- Standardised valuation model for longevity risk
- A risk management framework specific to longevity

The initial focus of the LLMA will be on the UK market, as this is currently the most developed market for longevity risk, but in the medium and long term, its remit will broaden to include other territories, such as the Netherlands and other European countries.

The hope is that the work of the LLMA will boost investor confidence in this asset class, resulting in an increase in the volume of transactions and increased stability for pension funds. Currently, the perceived complexity and lack of standardisation is a disincentive for investors thinking of taking on longevity risk. The increased transparency that the LLMA hopes to bring about in terms of product design, longevity indices, and pricing will help demystify the longevity risk transfer market.

The LLMA's efforts may further develop the appetite amongst investors for such trades, and this would facilitate opportunities of more affordable transfers for longevity risk bearers, and would allow pension funds to match assets and liabilities more closely via hedging of their longevity risk.

For more information on longevity risk, please contact Robert Bugg at *robert.bugg@milliman.com*, Farzana Ismail at farzana.ismail@milliman.com, Emma McWilliam at *emma.mcwilliam@milliman.com*, or your usual Milliman consultant.

Indemnity vs Parametric structures

Longevity risk transfer deals are usually transacted on an "indemnity" or a "parametric" basis. Indemnity deals have the feature that the risk-bearer agrees to pay the annuity benefit payments of the specific portfolio in question, even if that portfolio experiences mortality rates which are particularly adverse. Parametric deals involve the risk-bearer paying annuity benefit payments implied by a longevity index, which reflects the mortality experience of an agreed reference population, such as the population of England and Wales. In a parametric deal, the annuity writer/pension scheme is left with the residual "basis" risk that the mortality experience of the portfolio differs from that of the population on which the index is based.

Figure 2: List of Founding Members of the LLMA

Founding Members of the LLMA
AXA
Deutsche Bank
J.P. Morgan
Legal & General
Pension Corporation
Prudential PLC
RBS
Swiss Re

Source: http://www.llma.eu

2009 VARIABLE ANNUITY MARKET ROUNDUP

In the aftermath of the 2008 global financial crisis, 2009 was always going to be an interesting year for variable annuity (VA) products. Would sales volumes remain robust in the wake of increased hedge costs? Would consumers still perceive the products to be of value? Would insurance companies' hedging programs be able to withstand the strongest test the market had yet thrown at it? The answer to all of these questions is a resounding YES!

VA product launches have continued apace as evidenced by the continued expansion of the product suites of existing players (see Table 1).

Whilst 2009 sales volume figures for the UK market are not yet released, it looks like they will be comparable to 2008 volumes, based upon the data up until the third quarter. Clearly customers are still valuing the protection offered by guarantee products, with the decline in the equity markets still fresh in the minds of the investing public.

The exit of The Hartford from the UK market during 2009 will have obviously benefited the remaining companies (MetLife, Aegon, and Sun Life of Canada) in terms of increased market share. In the early part of 2009, many companies redesigned products to mitigate the increase in hedge costs during the global downturn in late 2008. Companies have shifted towards simpler features, such as a reduction in the complexity of asset allocation and the equity content to lower portfolio volatility, reducing guarantee benefit levels, and opting for use of passive funds that track indices in order to reduce basis risk. Some companies have focused on rounding out their product suites by expanding into other European countries and/or market segments. During 2009, hedge costs continued to decline gradually, leading to healthy margins for insurers in the market. It will be interesting to see how long this will persist before prices reduce and/or new players enter the market.

Instrumental to the ability of companies to remain active in the market has been the success of their hedging programs. Dynamic hedging programs have proven themselves to be very effective in mitigating the extreme stress experienced during the global downturn. We at Milliman produced a number of hedge effectiveness studies in 2008 and 2009 in both the United States and Europe. These studies have consistently shown hedge

TABLE 1: VA PRODUCT LAUNCHES DURING 2009

Company	Product Name	GMxx Type	Country	Date
Aegon / La Mondiale	Terre d'Avenir	WB / DB	France	Jan-09
MetLife	Auvida	WB	Greece	Feb-09
Allianz	Invest4Life	WB / DB	Italy	Feb-09
ING	Lifelong Income	WB	Belgium	Feb-09
Canada Life	Garantie Investment Rente	WB	Germany	Mar-09
Swiss Life	Exclusive Invest DWS	AB / DB	Germany	Apr-09
MetLife	Auvida	WB / DB	Spain	May-09
MetLife	Citi VA	WB	Belgium	May-09
AXA	AXA pensiones privilege	AB / DB	Spain	Jun-09
ERGO	Vorsorge Invest Plus	AB	Germany	Jun-09
Generali	Active Risparmio	AB / DB	Italy	Nov-09
Aegon	AEGON Variabele Lijfrente	WB / DB	Netherlands	Dec-09

effectiveness ratios of around 94%, which is extremely good and in line with expectations for the stresses experienced. Over the course of 2009, risk management standards have strengthened and hedge designs have become increasingly sophisticated. Volatility hedging is now more popular than it was before the crisis.

Given the severity of the market environment over the course of 2008 and 2009, it is encouraging to see the VA market taking the strain in its stride and emerging all the stronger for the experience. We expect the market to continue to develop and expand over the coming years to solidify its place in the wealth management product landscape.

If you would like to find out more about Milliman's product development or risk management services, please contact Gary Finkelstein at *gary.finkelstein@milliman.com*, Peter Lin at *peter.lin@milliman.com*, or your usual Milliman consultant.

AVOIDING OVERSIMPLIFICATION IN RISK ANALYSIS

(CONTINUED FROM PAGE 12)

This analysis immediately starts to give us clues about the shape of the risk profile emerging in this organisation. We see that regulatory risks tend to appear with product risks, for example. This organisation will therefore need to explore why this might be the case and to examine why its products are creating regulatory risk issues. We also observe that risk #13 is actually not "like" the other regulatory risks. Even though its dominant characteristic was that of being a regulatory change, it turns out that it has much more in common with business practices and control failure risks. We also observe that the risks related to control failure and unacceptable practices have recently evolved to incorporate technology-related risks.

In addition, there have been a number of evolutionary changes in the risk profile quite recently (i.e. there are lots of new branches near the right of the graph). This might indicate that emerging risks are a problem in this organisation, with many different types of risks mutating and creating new types of risk.

Next, we can look at a chart of how far the risks are from each other in an evolutionary sense, shown in Figure 4. Risks that are close at this stage of the risk profile's evolution are most likely to be seen in combination in the future. In this example, we can see that liquidity, tax, product, and succession planning are seen as particularly close to other risks. We would therefore not be surprised to see the characteristics of these risks appear in combination with others in the future. It will be instructive to examine these risks carefully to learn why they are so potent in the risk profile of the business, and to identify control changes which might reduce their influence.

Solvency II demands that companies think about risks in a more complete way, but typical risk systems still think of risks in terms of a single characteristic. This simplification makes the problem of aggregating risk information more tractable but also makes it almost impossible to learn much about how risks are interacting.

If you would like further information on applying Risk DNA Analysis techniques in your business, please contact Neil Cantle at neil.cantle@milliman.com, or Oliver Gillespie at oliver.gillespie@milliman.com.

Milliman's Risk DNA Analysis™ has been developed in collaboration with Neil Allan and Dr. Yin Yun from the University of Bath.

FIGURE 4: EVOLUTIONARY DISTANCES BETWEEN RISKS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Liquidity challenge																					
2. Regulation changes 1	2.955																				
3. Violation of Privacy Protection	2.955	3.319																			
4. Trusted Insider Technology Risks	0.168	3.093	0.455																		
5. Business Continuity	0.168	3.093	2.955	0.455																	
6. Technology development	0.258	3.154	2.576	0.029	0.258																
7. Product	0.109	2.576	3.028	0.258	0.258	0.455															
8. Geographical	2.762	0.455	3.319	2.955	2.955	3.028	0.258														
9. Regulation changes 2	0.168	0.455	2.955	0.455	0.455	2.576	0.109	0.455													
10. Succession Planning	0.065	2.762	2.955	0.168	0.168	0.258	0.109	2.762	0.168												
11. Model complexity	0.168	3.093	2.955	0.455	0.455	2.576	0.258	2.955	0.455	0.168											
12. Convergence of Products	0.168	0.455	3.093	0.455	0.455	2.576	0.029	0.168	0.168	0.168	0.455										
13. Regulation changes 3	0.258	3.028	2.576	0.109	2.576	0.168	0.168	2.870	0.258	0.258	2.576	0.258									
14. Poor decision making	0.168	2.955	3.093	0.455	0.168	0.258	0.258	2.762	0.455	0.168	0.455	0.168	2.576								
15. Misunderstanding of risks	0.168	3.093	2.955	0.455	0.168	2.576	0.258	2.762	0.455	0.168	0.455	0.455	2.576	0.455							
16. HR policies	0.258	3.154	2.576	0.258	0.258	0.455	0.455	3.028	2.576	0.258	2.576	2.576	0.168	0.258	0.258						
17. Long-term planning	0.258	2.576	3.154	2.576	2.576	2.762	0.168	2.576	0.258	0.109	0.258	0.109	0.455	0.258	2.576	2.762					
18. Tech infrastructure	0.168	3.093	3.093	0.455	0.065	0.258	0.258	2.955	0.455	0.168	0.455	0.455	2.576	0.065	0.455	0.258	2.576				
19. Tax rules	0.168	0.455	3.093	0.455	0.455	2.576	0.029	0.455	0.168	0.168	0.455	0.065	0.258	0.455	0.455	2.576	0.258	0.455			
20. Regulation differences	0.168	0.455	3.093	0.455	0.455	2.576	0.029	0.168	0.168	0.168	0.455	0.065	0.258	0.455	0.455	2.576	0.258	0.455	0.065		
21. Tax management	0.065	2.762	2.955	0.168	0.168	0.258	0.029	0.455	0.168	0.065	0.168	0.065	0.258	0.168	0.168	0.258	0.258	0.168	0.065	0.065	
22. Infrastructure	0.168	3.093	3.093	0.455	0.065	0.258	0.258	2.955	0.455	0.168	0.455	0.455	2.576	0.065	0.455	0.258	2.576	0.000	0.455	0.455	0.168

Green intersections show risks are less likely to combine.
Red intersections show risks are more likely to combine.

EVENTS TO COME

MILLIMAN CONSULTANTS ARE SPEAKING AT A NUMBER OF FORTHCOMING EVENTS. IF YOU HAVE NOT SIGNED UP ALREADY, IT MAY BE POSSIBLE TO GET A DISCOUNT BY MENTIONING THAT YOU ARE A MILLIMAN CLIENT.

DATE	ORGANISER	EVENT
21-22 April 2010	Westminster and City	Pension Buyouts, Longevity Swaps and the Pension Risk Transfer Market - The Next Stage
27 April 2010	Milliman	Milliman Expert Forum
29-30 June 2010	Infoline	Annuities and Retirement Income Products

Milliman is hosting its regular Expert Forum on 27 April 2010 at the Andaz Hotel, Liverpool Street, London. Attendance is free and the focus will be on Solvency II. If you would like to attend, or have suggestions for topics, we would be happy to hear from you at *expertforums@milliman.com*, and look forward to seeing you on 27 April.

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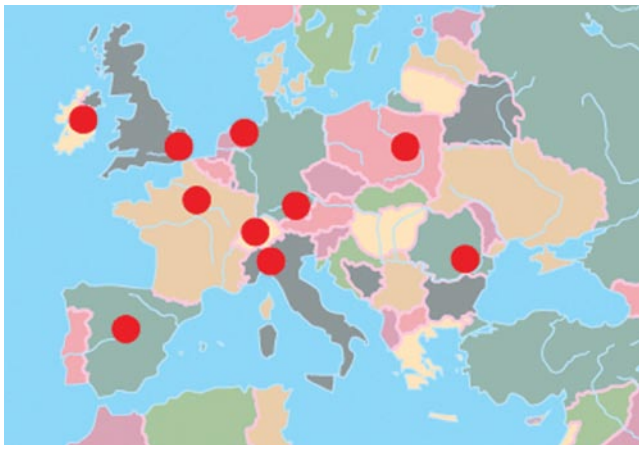

We also have ambitious plans for further expansion of our European presence. There are life consultants in all of these offices (totalling approximately 100 consultants), and non-life and health consultants in the larger offices. Our offices work seamlessly throughout the region on topics such as Solvency II, capital allocation and embedded value review to bring multi-nationals a consistent service and national firms the benefits of expertise tailored to their local requirements. In addition to our own research activities, we collaborate with leading academic institutions to bring the latest thinking into practical support for your business.

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CONTACT INFORMATION

11 Old Jewry, Third Floor
London EC2R 8DU
UK

Tel: +44 207 847 1500
Fax: +44 207 847 1501

milliman.com

For additional copies of the newsletter and to provide feedback, please contact your usual Milliman consultant or *robert.bugg@milliman.com*

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